Species at Risk Act
Recovery Strategy Series
Adopted under Section 44 of SARA

Amended Recovery Strategy for the Barrens Willow (*Salix jejuna*) in Canada

Barrens Willow

2018

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For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry[1].

Cover illustration: Barrens Willow © Peter Thomas, Environment and Climate Change Canada

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[1] http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1

AMENDED RECOVERY STRATEGY FOR THE BARRENS WILLOW (*Salix jejuna*) IN CANADA

2018

The *Recovery Strategy for the Barrens Willow (Salix jejuna) in Canada* (Environment Canada 2006) was originally posted on the Species at Risk Public Registry in October 2006.

Under the Accord for the Protection of Species at Risk (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada.

In 2006, in the spirit of cooperation of the Accord, the Government of Newfoundland and Labrador gave permission to the Government of Canada to adopt the *Recovery Strategy for Barrens Willow (Salix jejuna* Fernald*) in Canada* (Part 1) under Section 44 of the *Species at Risk Act* (SARA). At the time, Environment Canada included an addendum as a federal addition which completed the SARA requirements for this recovery strategy.

Under Section 45 of the Species at Risk Act (SARA), the competent Minister may amend a recovery strategy at any time. In this recovery strategy, only the federal addition (previously addendum) has been amended. Nevertheless, this amended recovery strategy replaces the *Recovery Strategy for the Barrens Willow (Salix jejuna) in Canada* published in October 2006.

This *Amended Recovery Strategy for the Barrens Willow (Salix jejuna) in Canada* (hereafter, 'amended recovery strategy') is for the purposes of:

- Updating critical habitat information
- Adding a description of activities likely to result in the destruction of critical habitat
- Adding a statement on action plans

The amended federal recovery strategy for the Barrens Willow in Canada consists of two parts:

Part 1 – *Recovery Strategy for Barrens Willow (*Salix jejuna *Fernald) in Canada*, prepared by Nathalie Djan-Chékar on behalf of the Braya Recovery Team for the Department of Tourism, Culture and Recreation, Government of Newfoundland and Labrador. (2003)

Part 2 – Amended Federal Addition (Addendum) to the *Recovery Strategy for Barrens Willow (*Salix jejuna *Fernald) in Canada*, prepared by Environment and Climate Change Canada. (2018)

Part 1 – *Recovery Strategy for Barrens Willow (*Salix jejuna *Fernald) in Canada,* prepared by Nathalie Djan-Chékar on behalf of the Braya Recovery Team for the Department of Tourism, Culture and Recreation, Government of Newfoundland and Labrador. (2003)

October 2003

Recovery Strategy for BARRENS WILLOW (*Salix jejuna* Fernald) in Canada

Prepared By:

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October 31, 2003

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Disclaimer:

This document was prepared to define the recovery strategies deemed necessary to protect and recover the Barrens Willow. It does not necessarily represent the official positions or views of each and every governmental or non-governmental organization or individual involved. The realization of the goals, objectives and actions identified in this document ultimately depend upon the ongoing program priorities and budgetary constraints of the participating departments and organizations. The goals and objectives may change over time in light of new findings.

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Djan-Chékar, N., L. Hermanutz, D. Ballam, T. Bell, J. Brazil, H. Mann, J. Maunder, S.J. Meades, W. Nicholls, L. Soper, and G. Yetman. 2003. Recovery Strategy for the Barrens Willow (*Salix jejuna* Fernald). Inland Fish and Wildlife Division, Government of Newfoundland and Labrador, Corner Brook. v + 11 pp.

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Figure 1. Range of the Barrens Willow (*Salix jejuna* Fernald) in Newfoundland.

EXECUTIVE SUMMARY

The Barrens Willow (*Salix jejuna* Fernald) is endemic to the limestone barrens of the Strait of Belle Isle on the northwestern part of the Great Northern Peninsula of Newfoundland. It is threatened by habitat loss and degradation, from land use activities. It was assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2001 as an endangered species, and listed as such under the Newfoundland and Labrador Endangered Species Act and the federal Species at Risk Act in 2002 and 2003, respectively. The recovery goal for this species is to secure the long term persistence of the natural population throughout its range. Achievement of this goal is primarily dependent upon the removal or mitigation of anthropogenic threats.

This strategy document outlines five recovery objectives for the Barrens Willow: 1) to assess and monitor the status of the natural population; 2) to assess range and population dynamics of the natural population; 3) to define threats and limiting factors and mitigate controllable ones; 4) lessen to the extent possible additional habitat loss and degradation due to human activities; 5) to implement a stewardship program with local residents and targeted groups. Highest priority actions are surveys, monitoring and critical habitat protection. Some of these actions, as well as others, such as habitat stewardship, are already underway.

PART I. BACKGROUND

1. Species Information

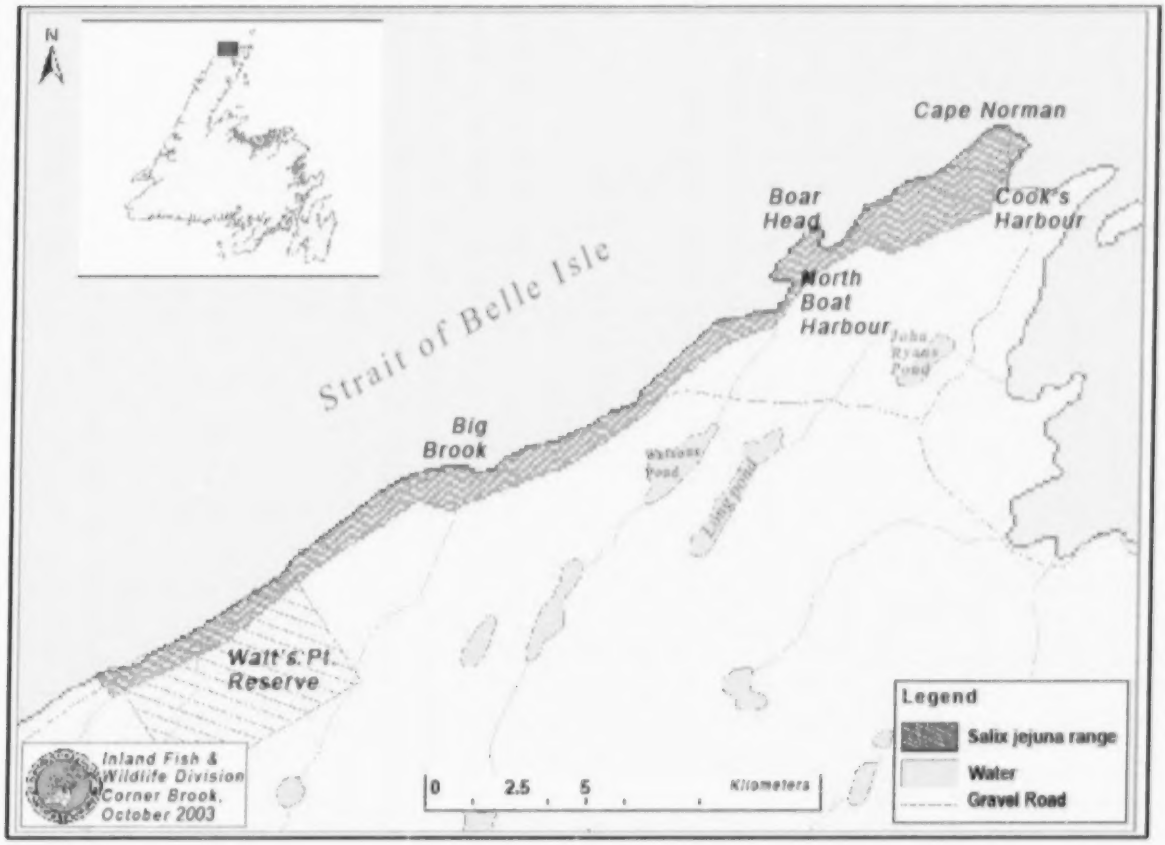
Common Name:	Barrens Willow
Scientific Name:	*Salix jejuna* Fernald
Assessment Summary:	COSEWIC, May 2001 (New)
Status:	Endangered
Reason for Designation:	Highly localized limestone barrens endemic occurring at only a few sites and subject to habitat loss and degradation from land use activities.
Occurrence:	NL (Great Northern Peninsula of Newfoundland)
Status History:	Assessed as Endangered by COSEWIC in May 2001 based on a new status report (Anions 2000).

Listed as Endangered under the Newfoundland and Labrador Endangered Species Act in July 2002 and the federal Species at Risk Act in June 2003.

2. Distribution

The Barrens Willow is endemic to the Strait of Belle Isle on the northwestern part of the Great Northern Peninsula of Newfoundland. Its distribution spans approximately 30 km of coast from Watts Point to Cape Norman (Fig. 1). It is still present at all known historic locations. Although there are few data available, extent of distribution has probably been stable since the species was first discovered by Wiegand and Long in 1925.

Figure 1. Range of the Barrens Willow (*Salix jejuna* Fernald) in Newfoundland.



3. Population Size and Trend

Anions (2000) reported less than 50 known individuals. Fieldwork conducted since indicates that the population is much larger: probably totaling more than 10,000 individuals. Available data are not sufficient to determine trends in population size.

The laying of roads through the habitat of the Barrens Willow, particularly in the latter half of the 20th century, may have adversely affected the population. Quarrying, mainly for road construction and maintenance, is another factor that possibly has had an adverse effect. On the other hand, the Barrens Willow is a pioneer species and now seems to thrive along disturbed

roadsides throughout its range. It is possible that road building and maintenance might have had a neutral or positive effect in some areas. Since the 1980s, when the Northern Peninsula Highway was built, there appears to have been only a few, localized disturbances within the range of the species.

4. Biological Limiting Factors

Habitat specificity is an important component of extinction risk (Rabinowitz 1981, as reported in Keith 1998). The Barrens Willow is endemic to a narrow band of coastal limestone barrens characterized primarily by arctic-like climatic conditions. Such harsh weather conditions, and natural processes like frost heave and abrasion by wind, typically limit plant growth. On the other hand, in more sheltered or shaded areas, competition from other plant species may limit the Barrens Willow's survival. It is unknown whether, or how, climate change might impact the amount of habitat available. Ultimately, population size and distribution are bound by the restrictive nature of the species' habitat.

Willow species generally hybridize readily. All willows, including hybrids, are vigorous pioneers that colonize disturbed habitats. In such habitats, hybrids can compete as well as pure individuals but they often display reduced viability and may die within a few years, or they may be infertile and survive only as vegetative plants (Argus 2003).

Herbivorous insects and pathogens have been observed and collected on the Barrens Willow. Their identities and impact on the willow population are unknown at this point.

5. Threats

According to Anions (2000), the main threat to this species has been loss of habitat. Further quarrying and/or road construction within the range of the species would constitute a significant threat (Argus 2003). Other known threats include habitat degradation associated with vehicular traffic, trails, and the maintenance of roads and infrastructure (Anions 2000). Off- trail vehicle use has been observed repeatedly by field biologists during recent years. Other potential threats include garbage dumping and net drying which have been observed in nearby areas. Anions (2000) also considered moose browsing and invasive plants to be potential threats. However, the risk posed by these threats is probably largely insignificant, as dwarf willows do not provide the kind of browse preferred by moose, and currently few introduced weeds are well adapted to the specific limestone barren habitat where the Barrens Willow occurs (Argus 2003).

6. Habitat Requirements

Currently, the Barrens Willow occupies exposed coastal limestone barren habitat where vegetation cover is sparse. It is found in dry to periodically wet conditions. The substrate is generally silt and/or sand accumulated in depressions and openings between rocks, or open silt, sand and gravel, sometimes sorted by frost. Given the small population size and restricted distribution of the Barrens Willow, all natural areas of occurrences are considered critical habitat, in other words habitat that is critical to the survival of the species.

7. Ecological Role

The Barrens Willow is one of three, known, endemic plant species occurring in the coastal limestone barren of the Great Northern Peninsula. The other endemic species are Long's Braya (*Braya longii* Fernald, Endangered) and Fernald's Braya (*Braya fernaldii* Abbe, Threatened). All three occupy sites where the vegetation cover is usually sparse due to regular disturbance by frost and wind. They are edge species, adapted to a marginal habitat. Many other vascular plant species that are rare in Newfoundland share this niche, disjuncts of arctic-alpine affinity found here at the southern limit of their range (e.g. *Bartsia alpina* L., *Pedicularis flammea* L., *Potentilla pulchella* R. Br. *ex* Ross). The presence of these species makes the Strait of Belle Ecoregion the richest in Newfoundland in terms of rare and exclusive vascular plants (Bouchard et al. 1991).

The Barrens Willow appears to be morphologically closest to *Salix ovalifolia* Trautv. and *S. stolonifera* Cov. (Argus 1997). These species are found in northwestern America, ranging from the Bering Sea and the arctic coast of Alaska and Yukon, south in the cordillera to a few isolated populations in the Rocky Mountains of British Columbia and Alberta. The evolutionary relationship between these species suggests that the Barrens Willow in Newfoundland is probably of refugial origin (Argus 2003). This hypothesis correlates with the presence of a significant number of species of arctic-alpine affinity within the same ecosystem.

Finally, the Barrens Willow is one of the dominant species at some sites. It probably plays a significant role as food source or shelter to a number of invertebrate species. It is also a pioneer species colonizing a habitat characterized by disturbance. Its presence could contribute to the establishment and survival of other plant species.

8. Importance to People

Botanists and natural history enthusiasts have long been attracted to the limestone barrens of the Great Northern Peninsula. One of the main points of interest is the unique limestone barrens flora. Endemic species like the Barrens Willow are an important component of this flora, and so contribute to the ecotourism potential of the area.

Residents of the Great Northern Peninsula have generally been supportive of and interested in plant conservation efforts within the region. For example, residents of Raleigh were instrumental the creation of a Provincial Botanical Ecological Reserve at Burnt Cape. They are now involved in the management of the reserve and development of activities around it. The Habitat Stewardship Program for the coastal limestone barrens of the Great Northern Peninsula, which is part of the recovery efforts for Long's and Fernald's Braya (Hermanutz et al. 2002), is another example. To date, the program has been very successful. Surveys of local residents have shown a strong interest in protecting the species at risk and their habitat. Three stewardship agreements have been signed in the area in 2002, including the first agreement with an elementary school in Canada.

Because of its unique features, the limestone barrens have also been, and continue to be, the subject of many scientific studies in the field of botany, zoology, ecology, and geology. Cape Norman, the type locality of the Barrens Willow, is of particular importance to science. The species itself, and its evolutionary relationships which suggest a refugial origin (see section 7 above), has the potential to provide interesting insight into the history of northern floras.

9. Knowledge Gaps

Additional information is required on population size and distribution, life history, population genetics, habitat, threats and limiting factors.

9.1. Survey Requirements:

Surveys to determine occurrence and population size need to be completed, in suitable habitat, within the known range of the species. Adjacent areas where similar habitat may also occur, notably Belle Isle, the southern Labrador coast, and Burnt Cape, should also be surveyed for occurrence of the species.

9.2. Biological/Ecological Research Requirements:

Further information is required on species recognition, life history parameters (longevity, reproduction, growth), population genetics, and detailed habitat requirements. This information, along with information on threats and limiting factors, is necessary to carry out a population viability analysis, and important for refining the definition of critical habitat and for supporting *ex-situ* conservation efforts. Although not critical to recovery, a comparative genetic study could provide insights into the evolutionary relationships of the Barrens Willow and origin.

9.3. Threat Clarification Research Requirements:

Natural and human-induced threats to the habitat are identified in the status report (Anions 2000). The importance of each of these threats and their prevalence on the landscape needs to be assessed. Pests and pathogens have been observed on the Barrens Willow. These still need to be identified and their potential impact assessed. The species may be sensitive to climate change, since its restricted habitat is apparently dependent upon narrow climatic parameters operating within a narrow coastal zone. Long term climatic data may be useful in determining trends. Surveys and research may identify other threats and limiting factors.

PART II. RECOVERY

10. Recovery Goal

The fact that the Barrens Willow is naturally restricted to a relatively rare habitat affects the scope of recovery. Increased risk of extinction is inherent to high habitat specificity in space and time (Keith 1998). This species will always remain rare with a relatively small population and very restricted distribution. Recovery in this case is dependent upon the removal or mitigation of anthropogenic threats. Notwithstanding natural limiting factors that might have a significant impact on the population, threat abatement should result in the long-term survival of the species; natural population size and distribution should remain stable. **The recovery goal for the Barrens Willow is therefore to secure the long term persistence of the natural population throughout its range.**

11. Recovery Objectives

Recovery actions undertaken over the next five years should address the following five objectives towards the achievement of long-term recovery goals.

I.	Assess and monitor the status of the natural population.
II.	Assess range and population dynamics of the natural population.
III.	Define threats and limiting factors and mitigate controllable ones.
IV.	Lessen to the extent possible additional habitat loss and degradation due to human activities.
V.	Implement a stewardship program with local residents and targeted groups.

12. Approaches to Meet Recovery Objectives

Priority	Objectives	Actions	Specific Steps	Key Performance Indicators
Urgent	I, II, III & IV	Biological surveys	- Survey potential habitat within and around the species' known range, to determine complete distribution and population size, and identify threats and their impact - Identify and map areas where the species occurs	- Complete survey of potential habitat within the known range - Comprehensive estimate of population size - Geo-referenced data and maps available to managers, stakeholders and enforcement officers - List of threats and their impact as observed in the field
Urgent	I, II, III & IV	Habitat protection	- Support the establishment by the provincial government of the proposed Cape Norman Ecological Reserve (type locality) - Delineate critical habitat - Identify and support other protection measures for occurrences outside reserves - Advise the appropriate property custodian (Department of Fisheries and Oceans) and the federal Minister of the Environment regarding the protection of the Barrens Willow in the Cape Norman federal property	- Establishment of Cape Norman Ecological Reserve - Map of critical habitat - List of protection measures required at each site - Initiation of protection process at each site - Drafting of necessary regulations under the Provincial Endangered Species Act and Wilderness and Ecological Reserves Act - Completion of protection plan - Drafting of the appropriate management policies for the Cape Norman federal property as required by the federal Species at Risk Act

Urgent	I & II	Monitoring	- Establish long term monitoring of each population - Determine and monitor land use patterns	- Establishment of monitoring plots - Establishment and maintenance of geo-referenced database on land use activities
Necessary	I & II	Demographic research	- Determine key demographic parameters (reproduction, growth, longevity, survivorship, persistence of seed bank and seed viability) based on monitoring data	- Continued collection and analysis of demographic data
Necessary	I & III	Taxonomic research	- Improve understanding of species definition	- Preparation of descriptions, keys, illustrations and collection of specimens that clarify identification of this and other species of willows, and their hybrids
Necessary	I, II, III, IV ~~& V~~	Ecological research	- Determine the ecological requirements of the species - Define critical habitat - Identify limiting factors and natural threats, including climate change	- Description of ecological requirements of the species - List of limiting factors and natural threats and their actual and potential effect - Use of ecological data in critical habitat models and analysis of viability of the population
Necessary	IV & V	Public outreach	- Survey local communities to determine the attitudes of local populations towards conservation of the species - Encourage stewardship opportunities and produce education material	- Completion of initial survey - Involvement of residents in stewardship initiatives

Necessary	I, II & III	Compliance to regulations	- Work to ensure compliance to protection measures under the Endangered Species Act and the Wilderness and Ecological Reserves Act (e.g. training of conservation officers and public information)	- Training of local conservation officers in the recognition of the species and its habitat - Involvement of all relevant government departments - Public awareness regarding the acts and attached regulations - Frequent and regular of visits by compliance officers to the area
Beneficial	I	Genetic research	- Determine genetic diversity within and between populations - Determine breeding system	- Description of genetic variability within and between populations - Description of breeding system
Beneficial	I, IV ~~& V~~	*Ex-situ* conservation	- Establish an *ex-situ* collection of living plants and a tissue bank - Develop techniques for cultivation and re-introduction if ever necessary	- Existence of an *ex-situ* collection of living plants and a tissue bank representative of genetic diversity observed in wild population - Description of techniques required for cultivation and re-introduction of the species
Beneficial	III, IV & V	Restoration	- Identify and restore disturbed areas within the range with the aim of improving the aesthetic value of the landscape	- List of disturbed areas within the range - Elaboration and completion of a restoration plan

13. Ecological and Technical Feasibility of Species Recovery

As discussed above, the Barrens Willow will always remain rare and its survival is dependent upon the removal or mitigation of anthropogenic threats. Commercial exploitation and other development of the limestone barrens can be limited through internal cooperation among governmental agencies responsible for resource management. On the other hand, global warming, which may prove to be a significant anthropogenic threat, would be very difficult to address at a regional scale. It is beyond the scope of this recovery strategy.

Highest priority actions for recovery of this species consist of surveys, monitoring and habitat protection. Other important steps include demographic, taxonomic and ecological research, public outreach and compliance to regulations. Surveys, ecological research and habitat protection for the limestone barrens are already under way as part of recovery efforts for Long's and Fernald's Braya (Hermanutz et al. 2002). The same is true for public outreach, under the auspices of the Limestone Barrens Habitat Stewardship Program.

In order to clarify our understanding of threats and limiting factors, to complete surveys, and to set up monitoring sites, a large initial investment of time and resources will be needed. Efforts in terms of research, monitoring and compliance to regulations, and involvement with local communities will be long-term. Because the area where the species occurs is far from major centres, any work in the area and contact with local communities involves significant investments in terms of travel time and communication costs.

The *ex-situ* collection will provide an alternate source of material for research and possibly reduce costs as well as the need for destructive sampling of the wild population. This collection will also serve as a backup to conservation in the wild.

14. Potential Impacts of Recovery Strategy on Other Species/Ecological Processes

The Barrens Willow is restricted to a rare habitat type, and lives within a unique biological community. Protection of this habitat will ensure protection of many of the other rare species and ecological processes characteristic of this unique ecosystem. Rare species found within the range of the Barrens Willow include the threatened Fernald's Braya. Restoration aimed at improving the esthetic value of the landscape will increase its stewardship value and in the long-term possibly provide renewed natural habitat for limestone barren species.

15. Anticipated Conflicts or Challenges

The general area where this species occurs has been, and will likely continue to be, exploited as a source of limestone gravel for road building and maintenance. Management of local quarry operations is starting to take into account the presence of rare plants. However, conservation efforts should continue; and appropriate tools to inform managers of the occurrence of potential habitat should be developed and communications improved.

Part of the species' range (Cape Norman) has been identified as the most important dolomite deposit on the west coast of Newfoundland. At this point in time, interest in this mineral resource, by the Newfoundland and Labrador Department of Mines and Energy, is only

at the exploratory stage. No claim has been established.

Maintenance of roads and infrastructure within the range of the species could directly threaten portions of the population and conflict with recovery efforts. Mitigation measures may need to be developed.

Finally, there are economic challenges in the area which have the potential to create additional development pressure on the species and its habitat. These challenges have recently been aggravated by the collapse of the local fishery.

17. Actions Completed or Underway

This recovery strategy will be implemented as part of a multi-species recovery effort centered on the coastal limestone barren habitats of the Great Northern Peninsula of Newfoundland (Hermanutz et al. 2002). Several actions are already underway, including a habitat stewardship program, ecological research into the physical factors and processes characterizing limestone barren habitats, surveys of potential habitat, and the development of an *ex-situ* collection of live specimens. Actions completed include the creation of an Ecological Reserve for the protection of rare plants in the southern portion of the species range (Watt's Point). Potential habitat has been mapped. Finally, known areas of occurrence have been identified on the provincial Crown Lands Atlas as Sensitive Wildlife Areas, to ensure the referral of all development proposals for these areas to the Inland Fish and Wildlife Division for review.

18. Evaluation

See key performance indicators in Section 12. As well, an action plan detailing the approaches to meet recovery objectives will be prepared within a year of the release of this plan.

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Annex 1. Procedure for determining *Critical Habitat* for Barrens Willow

Compiled by Braya Recovery Team, May 25, 2005.

- Mandated under Section 28, Endangered Species Act (SNL2001 Chapter E - 10.0)

- Data used to prepare these maps are based on records from the *"Rare plant database"* housed within the IFWD and observational records from Recovery Team members and scientists, for a total of over 27,000 observational records that have been geospatially referenced, with 1 in 5 verified.

- Maps for all species include both historical and recent records, except for those historical records from which locations cannot be verified. These records have a Locational Accuracy Level of 2 and 1, respectively (Level 1=10m and Level 2=100m).

- *Potential* habitat within the Limestone Barrens for each species was delineated from aerial photographs. [**Limestone barrens are defined as limestone areas with vegetation cover less than 10 cm in height over thin discontinuous sediment showing signs of frost action (for example, frost boils or sorted circles)**].

- Once potential habitats were field checked, they were designated as either *suitable* habitat or *unsuitable* habit. Suitable habitats were further surveyed for species presence. If the habitat has the species present, it is automatically designated as Critical Habitat.

- Those potential habitat areas that remain to be field-checked retain their original designation. Future site surveys will follow the above protocol. See Appendix 1 for flow diagram.

- Critical habitat was delineated separately for each species, based on their endangerment and biology.

- The spatial extent of each habitat type was mapped using a central point and a maximum radius to inscribe a circle that encompassed the entire habitat. Parts of the circle that clearly are not suitable habitat (e.g. water bodies, forest and other land cover types that appear as mapped layers within our GIS database) were deleted.

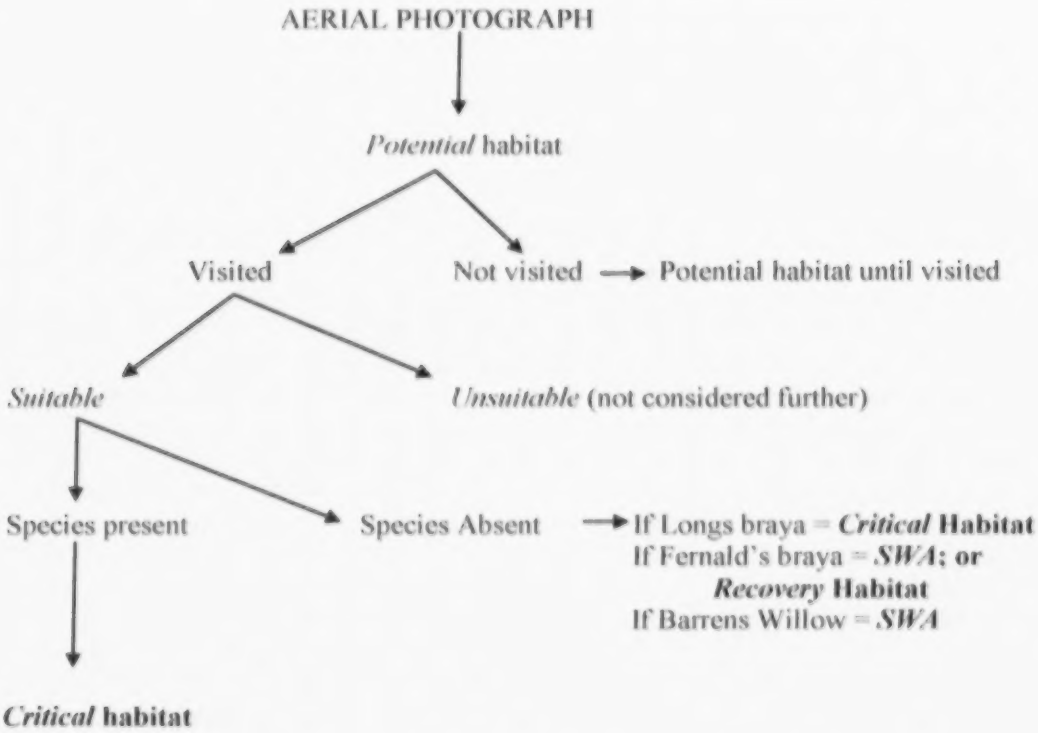
Barrens Willow (*Salix jejuna*)

Barrens Willow has an intermediate distribution compared with the two braya species, from Eddies Cove South to Cape Norman, approx. 40 km. In contrast to braya, it does not have a long-lived seedbank, therefore it can be assumed that if there are no plants currently growing at a site that it is unlikely that they will in the near future. Therefore suitable substrates with no plants present have been designated as *"Sensitive Wildlife Areas"*.

1. All suitable habitats with willow present have been designated as "*Critical habitat*".

2. All sites with suitable habitats that are not presently occupied, as well as those sites of potential suitability have been designated as *"Sensitive Wildlife Areas"*.

Flow diagram of designation of habitat types.



Part 2 – Amended Federal Addition (Addendum) to the *Recovery Strategy for Barrens Willow (*Salix jejuna *Fernald) in Canada*, prepared by Environment and Climate Change Canada

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Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[1] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years after the publication of the final document on the SAR Public Registry.

The Minister of Environment and Climate Change is the competent minister under SARA for the Barrens Willow and has prepared the federal component of this amended recovery strategy (Part 2), as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with the Government of Newfoundland and Labrador, as per section 39(1) of SARA. SARA section 44 allows the Minister to adopt all or part of an existing plan for the species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)). The Department of Tourism, Culture and Recreation, Government of Newfoundland and Labrador led the development of the attached recovery strategy for the Barrens Willow (Part 1) in cooperation with Environment and Climate Change Canada and Fisheries and Oceans Canada.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment and Climate Change Canada and Fisheries and Oceans Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Barrens Willow and Canadian society as a whole.

This amended recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment and Climate Change Canada and Fisheries and Oceans Canada, and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When critical habitat is identified, either in a recovery strategy or an action plan, SARA requires that critical habitat then be protected.

[1] http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area[2] be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat is included in the public registry. A prohibition against destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

For critical habitat located on other federal lands, the competent minister must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies.

If the critical habitat for a migratory bird is not within a federal protected area and is not on federal land, within the exclusive economic zone or on the continental shelf of Canada, the prohibition against destruction can only apply to those portions of the critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies as per SARA ss. 58(5.1) and ss. 58(5.2).

For any part of critical habitat located on non-federal lands, if the competent minister forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, or the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to prohibit destruction of critical habitat. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

[2] These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Birds Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

Acknowledgements

Development of this amended recovery strategy was coordinated by Kathy St. Laurent and Marie-Andrée Carrière (Environment and Climate Change Canada – Canadian Wildlife Service). Preparation of this amended recovery strategy occurred concurrently to the development of the action plan and as such thanks to members and associated specialists of the Limestone Barrens Species at Risk Recovery Team for their input and expertise from that process are extended here.

Additions and Modifications to the Adopted Document

The following sections have been included to address specific requirements of the federal *Species at Risk Act* (SARA) that are not addressed in the *Recovery Strategy for Barrens Willow (*Salix jejuna *Fernald) in Canada* (Part 1 of this document, referred to henceforth as "the provincial recovery strategy") and/or to provide updated or additional information.

Under SARA, there are specific requirements and processes set out regarding the protection of critical habitat. Therefore, statements in the provincial recovery strategy referring to protection of critical habitat may not directly correspond to federal requirements. Recovery measures dealing with the protection of habitat are adopted; however whether these measures will result in protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy.

1. Critical Habitat

Critical habitat is the habitat that is necessary for the survival or recovery of the species. Section 41(1)(c) of SARA requires that the recovery strategy include an identification of the species' critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction.

The 2006 federal recovery strategy, based on the 2003 provincial recovery strategy developed by Newfoundland and Labrador, identified critical habitat for the Barrens Willow as "all natural areas of occurrences". This section clarifies that identification of critical habitat and adds to that identification newly (ca. 2014) discovered occurrences of the species. This section also adds to the general methodology provided in Annex 1 of the provincial recovery strategy.

Critical habitat for the Barrens Willow is partially identified in this document, to the extent possible, based on the geographic location and biophysical attributes. It is recognized that the critical habitat identified in this recovery strategy is insufficient to meet the population and distribution objective[3]. A schedule of studies has been

[3] Referred to as a recovery goal in the provincial recovery strategy (Part 1 of the Amended Recovery Strategy for the Barrens Willow (*Salix jejuna*) in Canada).

developed to provide the information necessary to complete the identification of critical habitat (see next section: Schedule of Studies).

1.1 Identification of the Species' Critical Habitat

Critical habitat for the Barrens Willow is identified within the defined geographic location (1.1.1) as all areas of naturally-occurring limestone barrens habitat where the biophysical attributes (1.1.2) are found, and that are occupied by the species. In general, these areas are exposed coastal limestone barren habitat where vegetation cover is sparse due to regular disturbance by wind and frost. These areas experience dry to periodically wet conditions related to the amount of rain and snowfall. The substrate[4] is generally silt and/or sand accumulated in depressions and openings between rocks, or open silt, sand and gravel, sometimes sorted by frost[5].

Areas containing critical habitat were delineated using a central point within naturally-occurring limestone barrens habitat known to be occupied by the species and using the distance from that point to the furthest edge to inscribe a circle that encompassed the entire habitat; as the habitat areas were different shapes and sizes, the distance from the central point to the furthest edge necessarily varied. Parts of the circle that clearly did not contain the biophysical attributes of critical habitat (e.g. water bodies, forest and other land cover types that appear as mapped layers within our GIS database) were removed.

1.1.1 Geographic Location
Critical habitat for the Barrens Willow is located within the Strait of Belle Isle ecoregion along the north coastal section of the Great Northern Peninsula of Newfoundland between Eddies Cove (51° 25′ N and 56° 26′ W) and Cook's Harbour (51° 36′ N and 55° 53′ W). See Figures 1 to 7 for more detail on the location of critical habitat.

1.1.2 Biophysical Attributes
Within the areas identified as containing critical habitat for the Barrens Willow, critical habitat exists where naturally-occurring limestone barrens habitat with the following biophysical attributes occurs:

- substrate is a mixture of exposed calcareous bedrock outcrops[6], thin layers of frost-shattered[7] calcareous gravel and shallow calcareous soils; and
- substrate characterized by angular boulders, rocks, and pebbles, often in a fine-grained sediment matrix; and

[4] The surface or material on or from which an organism lives, grows, or obtains its nourishment.
[5] Frost sorting is a geologic process whereby differential frost heaving sorts unconsolidated material (i.e., reorganization of surface material into similar sizes) and is a key mechanism in the formation of some types of patterned ground surfaces such as sorted stripes and sorted circles.
[6] The part of a rock formation that appears above the surface of the ground.
[7] Frost shattering is a process that occurs in cold climates whereby water enters cracks in exposed rocks, subsequently freezes and the pressure created by the ice causes the rock to break apart.

- vegetation height less than 10 cm; and
- vegetation cover rarely exceeding 50%; and
- in some cases, substrate may be sorted by frost action (i.e., a circular or striped pattern may be present - see footnote 5.

Barrens Willow can sometimes establish in limestone barrens habitat altered by human activities (e.g., areas cleared to build road surfaces and to support power and telephone pole construction). However, despite such capability, abiotic[8] limitations including substrate moisture, particle composition and thermal regime prevent long-term viable establishment for some rare species (Janes 1999). Habitat altered by human activity contains homogenous gravel substrates that do not exhibit patterning or sorting, are missing a distinct fine-grained component, and have low plant species diversity (Greene 2002; Rafuse 2005; Robinson 2010). These areas altered by human activities are therefore not considered critical habitat. Restored limestone barrens habitat occupied by the species will be considered for critical habitat identification if the biophysical attributes listed above are present.

[8] Physical rather than biological; not derived from living organisms. Abiotic factors in an environment include such items as sunlight, temperature, wind patterns, and precipitation.

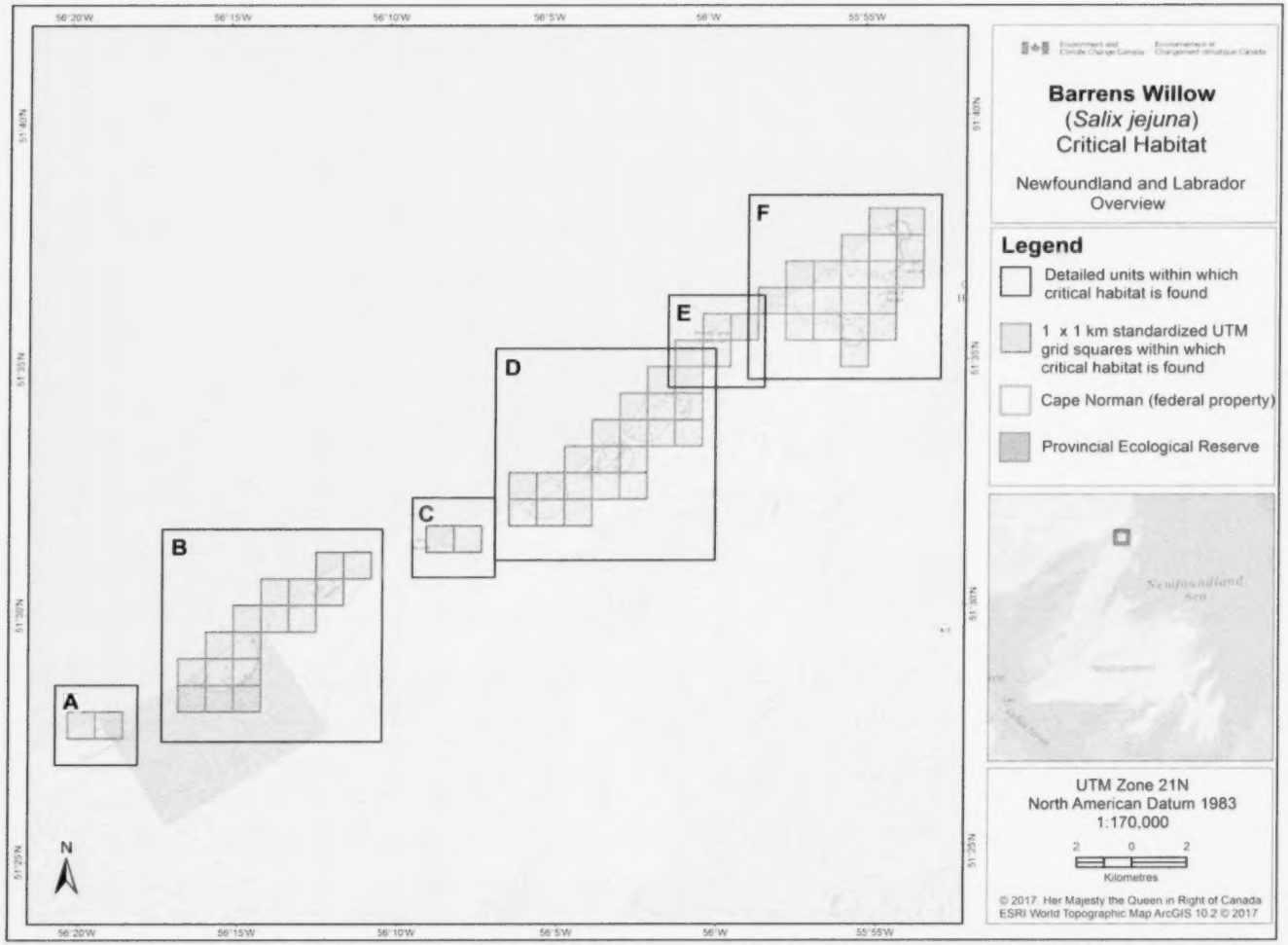

Figure 1. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

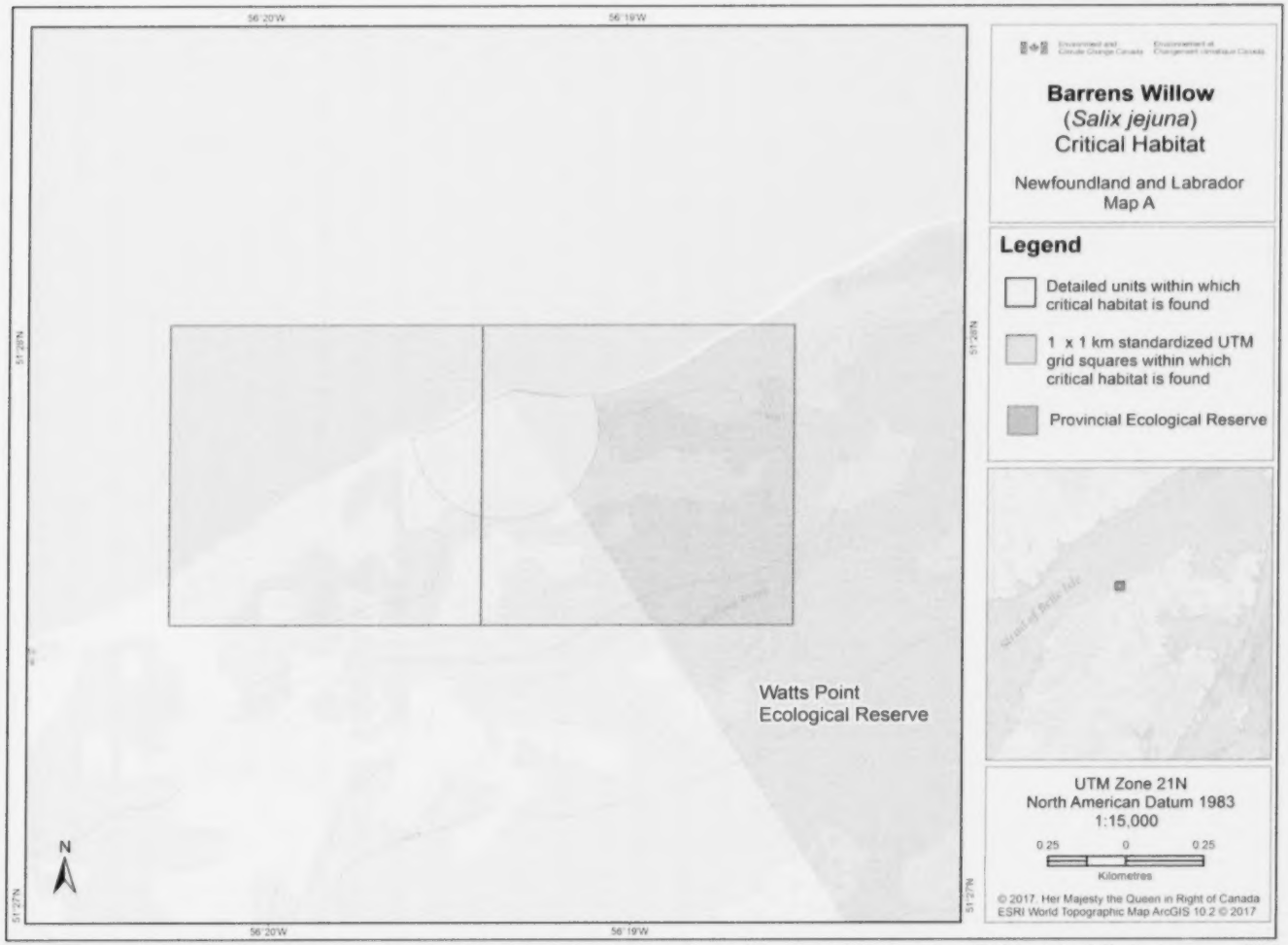

Figure 2. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

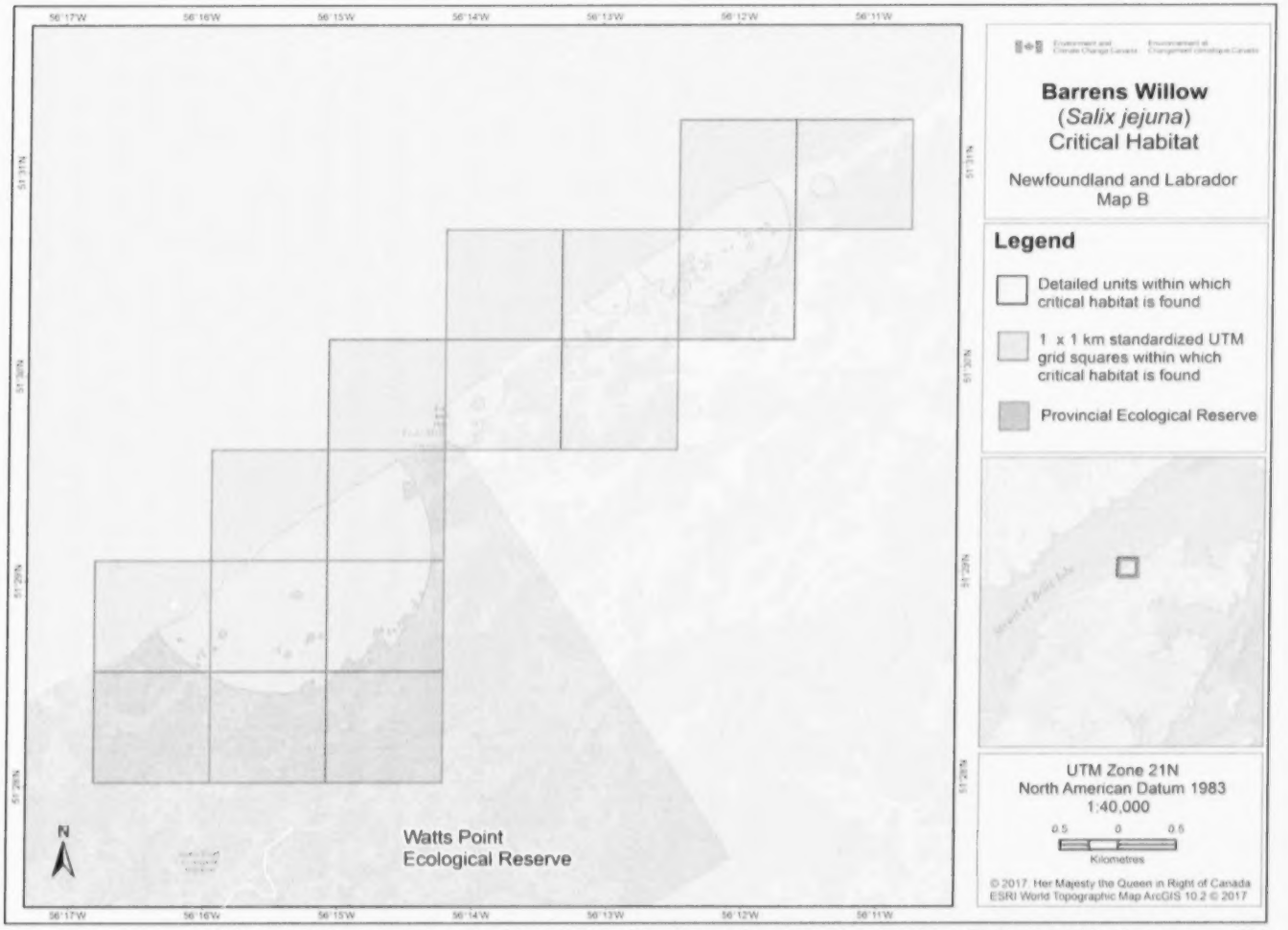

Figure 3. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

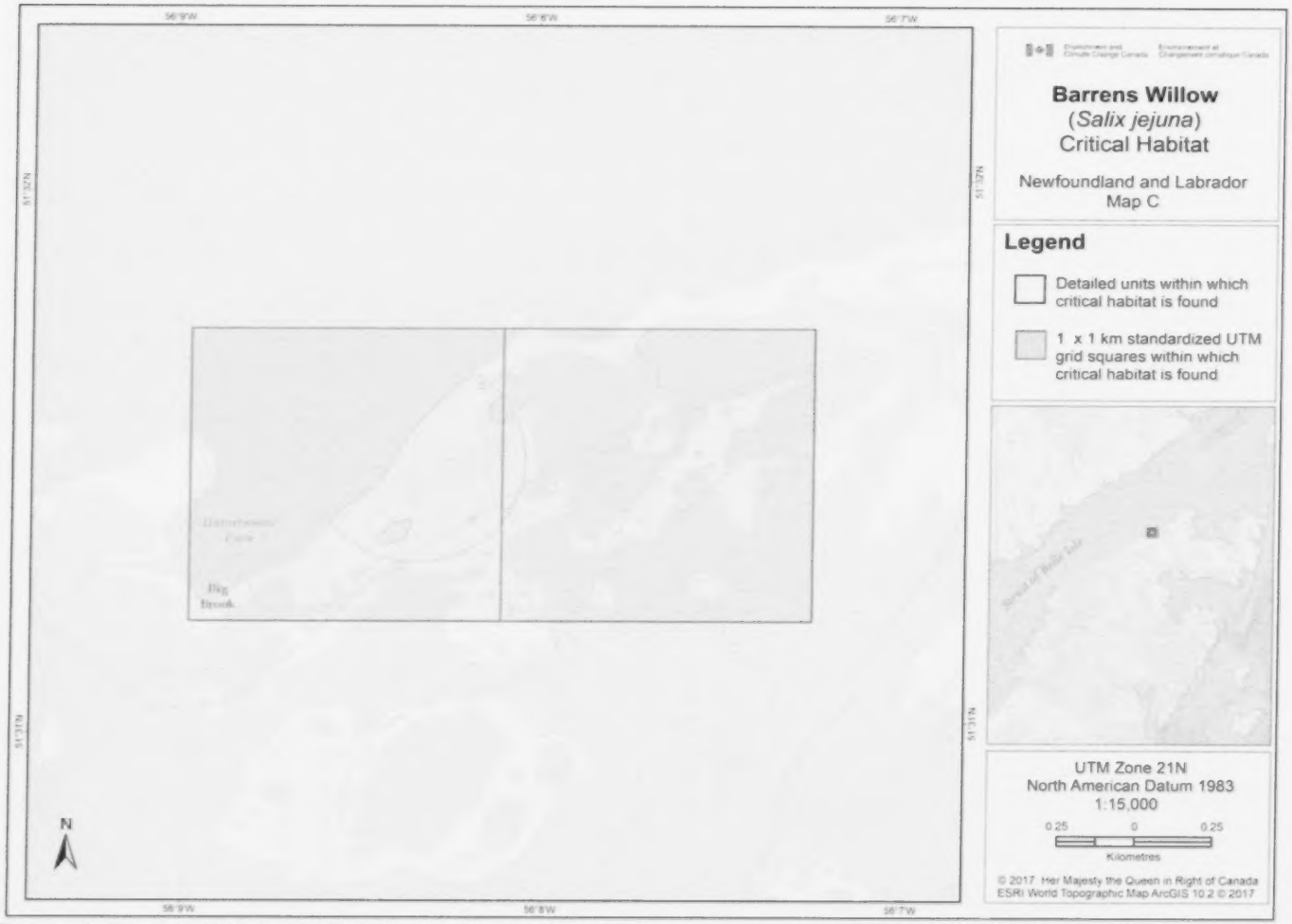

Figure 4. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

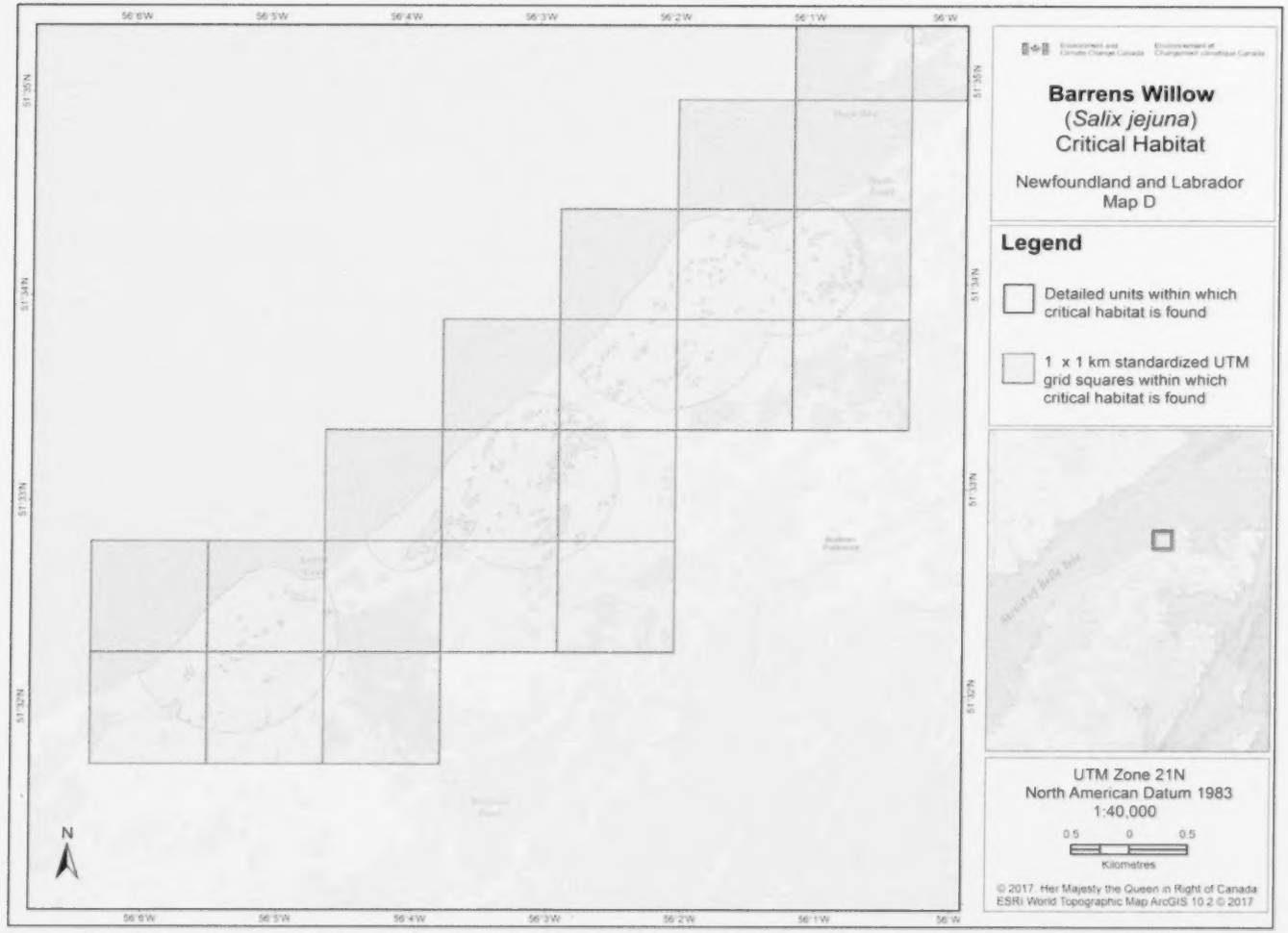

Figure 5. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

Figure 6. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

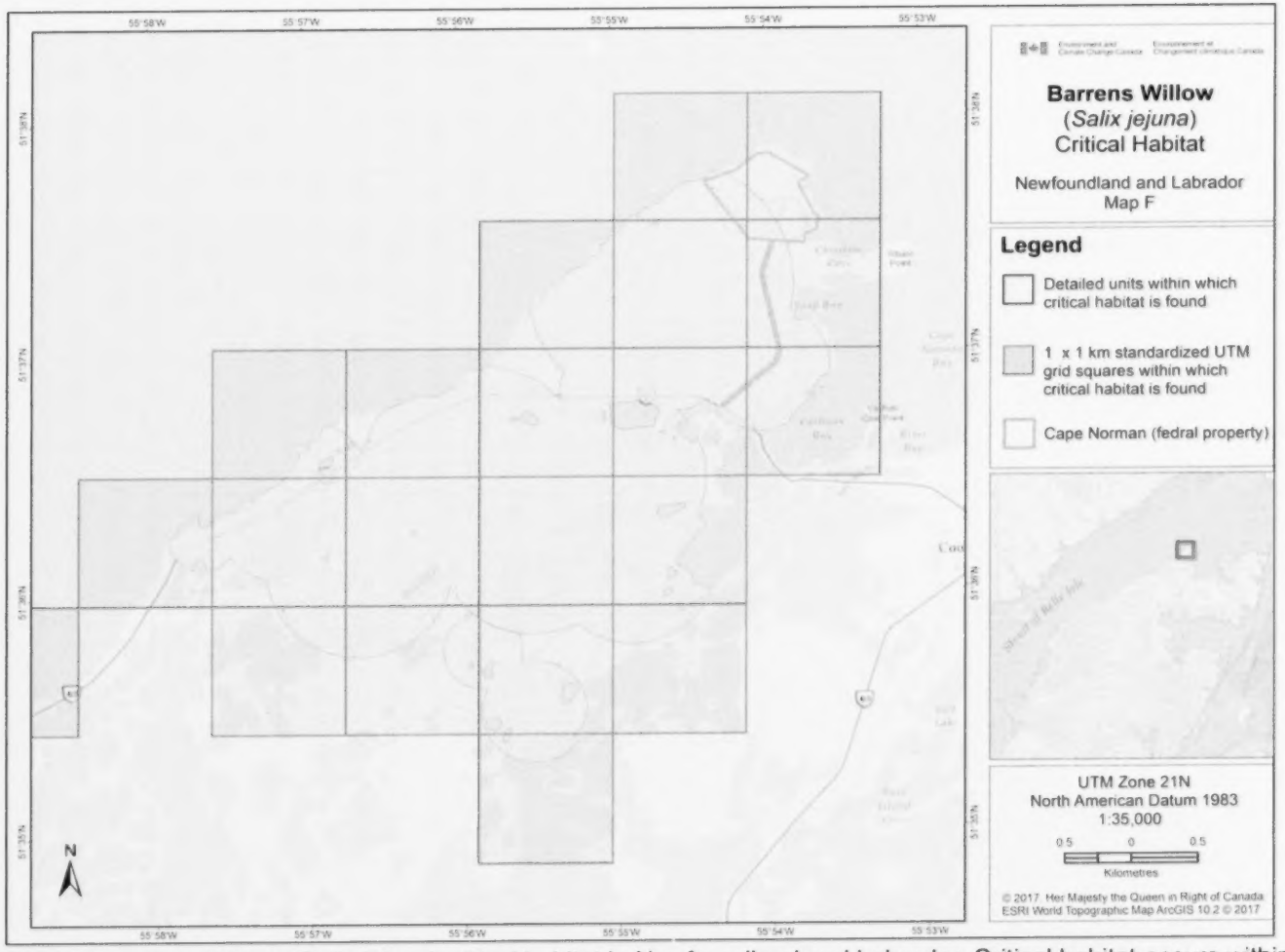

Figure 7. Barrens Willow (*Salix jejuna)* critical habitat in Newfoundland and Labrador. Critical habitat occurs within the yellow shaded polygons where the biophysical attributes are met. The 1 km x 1 km UTM grid square overlays (red outline with pink shading) are part of a standard national grid system that highlights the general geographic area containing critical habitat.

1.2 Schedule of Studies

The provincial recovery strategy developed by Newfoundland and Labrador outlines the research to be done on the species' ecology and conservation. The following schedule of studies (Table 1) outlines the activities required to complete the identification of critical habitat for the Barrens Willow.

Table 1. Schedule of Studies to Identify Critical Habitat

Description of Activity	Rationale	Timeline
Finalize surveys of potential habitat	The completion of surveys to locate natural areas of occurrence within priority areas is needed to fully identify critical habitat.	2014-2019
Study population dynamics in order to establish a quantitative population and distribution objective	Quantifying the population and distribution objective will allow for a more thorough assessment of the amount of critical habitat needed to meet the objective.	On-going
Determine biophysical factors explaining presence of the species and habitat quality, including factors related to colonization or introduction	Understanding factors related to species 'presence and persistence will ensure the description of biophysical attributes is complete.	On-going

1.3 Activities likely to result in destruction of critical habitat

Understanding what constitutes destruction of critical habitat is necessary for the protection and management of critical habitat. Destruction of critical habitat is determined on a case-by-case basis. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from single or multiple activities at one point in time or from the cumulative effects of one or more activities over time. Activities described below include those likely to cause destruction of critical habitat for the species; however, destructive activities are not limited to those listed.

1) The removal of substrate, vegetation and/or the organic layer, or the deposition of material that prevents Barrens Willow from germinating, establishing, growing and/or reproducing. Specific examples include commercial or industrial activities, such as limestone gravel excavation, quarrying, drilling, and road construction, including the deposition of associated materials and by-products from of these activities (e.g., gravel and stone piles). Other local activities include the development of recreational trails for eco-tourism purposes.

2) Substrate compaction and substrate damage (e.g., limestone shattering) that affects normal root function, seedling recruitment, and natural hydrologic patterns. Specific examples of activities capable of causing compaction and substrate damage

include the use of vehicles (e.g., all-terrain vehicle, dirt bike, heavy equipment, car, etc.) off of designated trails and roadways, for example, to conduct maintenance of roads (off of the existing road bed), utility corridors, and service lines; use of off-road vehicles in areas other than on designated roadways/trails; and the placement of temporary or permanent structures. It is important to note that even a single pass of a vehicle, especially when the substrate is wet, can cause enough compaction to result in the loss of habitat function.

3) Any activity that reduces the quality of habitat by removing, adding or covering substrate or otherwise damaging components of the plant community. Specific examples include the laying out of fish nets or other fishing equipment, the collecting of rock or plants for horticultural purposes, picnicking in places other than those marked for that purpose, the depositing of waste material, and the introduction of plants or animals non-native to the limestone barrens.

All of these activities can have severe impacts on habitat that is critical to the persistence of the species and can result in direct plant mortality and population decline.

2. Statement on Action Plans

One or more action plans for the Barrens Willow will be posted on the Species at Risk Public Registry within two years of the final posting of the amended recovery strategy.

3. Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*[9]. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the Federal Sustainable Development Strategy's[10] (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

[9] www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[10] www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1

The Barrens Willow is restricted to a rare habitat type, and lives within a unique biological community; it is an endemic species to Canada found nowhere else on earth. Protection of this habitat will ensure protection of many of the other rare species and ecological processes characteristic of this unique ecosystem (Djan-Chékar et al. 2003). Rare species, also endemic, that will benefit from recovery approaches for the Barrens Willow include the Endangered Fernald's Braya (*Braya fernaldii*) and Long's Braya (*Braya longii*). The potential for the strategy to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this plan will not entail any significant adverse effects.

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